

University of Groningen

## Habitat selection by *Lipara lucens* Mg. (Diptera, Chloropidae) and its survival value

Mook, Jacob Hendrik

**IMPORTANT NOTE:** You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

1967

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Mook, J. H. (1967). *Habitat selection by Lipara lucens* Mg. (Diptera, Chloropidae) and its survival value. Noordhoff Uitgevers.

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

This tendency to cluster, however, will be counteracted to some extent by the randomness in the direction of searching flights of the ovipositing females.

Obviously, this subject cannot be pursued at present beyond these qualitative remarks. Data for a quantitative evaluation of these influences are lacking. In closing this discussion, however, it is worth pointing out that, if further work should confirm the hypothesis that larval survival is optimal on shoots of sizes preferred for oviposition (p. 539), differential survival could be said to enhance the influence of habitat selection on the distribution of *Lipara lucens*.

#### X. SUMMARY

I. This study concerns the analysis of some aspects of habitat selection by the chloropid fly *Lipara lucens* Mg., based on field data and the results of experiments done in the field and in the laboratory.

II. The flies emerge in late spring and lay eggs on fresh shoots of Common Reed (*Phragmites communis* Trin.). Immediately after hatching, the larvae migrate on the surface of the reed shoot to the top and then downwards through the centre of the roll of young leaves until they reach a position just above the growing point. In the following period, during which the larva remains in the same place and feeds on the very young leaves, a gall is formed because the internodes of the stem remain short and grow in width. After completion of the gall in late summer, the larva eats its way through the growing point to reach the parenchymatous pith of the gall, in which it eats out a chamber. The larva hibernates in this gall chamber.

III. The habitat of *Lipara lucens* has been characterized in the literature as reed vegetation on dry soil. DOCTERS VAN LEEUWEN assumed that the water level influences the gall distribution not directly but via the development of the reed shoots, which is less vigorous in dry than in wet conditions. This hypothesis was taken as a starting point for the present investigation. The criterion taken for shoot development was the basal diameter of the reed shoots, since this is the only easily measured property that remains reasonably constant throughout the season.

IV. A partial regression analysis of the series of samples from three reed vegetations revealed that of three environmental variables, i.e. mean basal shoot diameter, shoot density, and water level, the partial regression of shoot diameter on gall density was significant in all three cases.

No significant partial regression was found for shoot density, and partial regression of water level on gall density was significant in one series only.

The correlation between shoot diameter and gall density was found to be caused both by a preference of the flies when laying eggs and by differential mortality of the larvae before gall completion.

V, VI. Egg-laying was investigated in choice experiments done in a field cage on whole shoots and in the laboratory on top parts of shoots. In both situations a preference was found for shoots in the medium range of shoot diameters. Detailed observation of the behaviour of the flies in the laboratory showed that the numbers of visits to shoots of all diameters were similar but that behaviour on the shoots differed, leading to longer visits and the laying of more eggs on shoots of medium diameter.

Other laboratory experiments showed that shoot diameter plays a role as a stimulus, but that other stimuli, possibly chemical, are also important. When the flies had access to shoots of only one diameter class at a time, the egg production on shoots of medium diameter remained greater than that on thicker shoots.

VII. Survival of the larvae up to gall formation was studied in a field experiment. Survival was greatest on the thinnest shoots and decreased with increasing shoot diameter. No correlation was found between survival and the distance the larvae had to travel on the surface of the shoot (which tends to be greater for the thicker shoots), despite the fact that the larvae are very vulnerable to drought. This phenomenon is probably explained by the fact that the larvae hatch during the night and are able to cover the distance within a few hours, at a time when the shoot surface is moist with dew.

Differential survival could be demonstrated for the next period, during which the larvae migrate from the surface near the top of the shoot to the growing point. Fewer larvae reach the growing point in thick shoots than in thin ones, probably because thick shoots have more layers of leaf sheaths to be passed and the distance from the top to the growing point is greater.

Nothing is known about the interaction between larva and reed plant that results in gall formation.

Combination of the estimates of egg distribution and survival in relation to shoot diameter gives a probability distribution of galls on shoots of different diameters which resembles the average distribution of galls in the field rather well. It is remarkable that the preference of the flies and the survival up to gall formation do not fall in the same classes, the latter being greater on shoots that are thinner than those on which most eggs are laid.

VIII. Survival of the larvae in the gall is also correlated with shoot diameter. Survival increases with increasing shoot diameter, as a combined effect of predation (especially by birds, i.e. Blue Tits, *Parus caeruleus*) and parasitization by the chalcid *Stenomalina liparae*, which take a greater toll on the thinner shoots. The other important parasite, the braconid *Polemon liparae*, induces a somewhat higher mortality on the thicker shoots than on the thinner ones when it is present alone, but in most populations its average influence is not important enough to counterbalance the influence of the other two factors mentioned.

IX. The distribution of egg laying and survival during the whole larval period over shoots of different diameters were compared to determine the extent to which egg-laying preference has survival value. No reliable conclusions can be drawn because of the accumulation of random errors in the estimate of survival, but the calculated curves for oviposition preference and survival do not seem to coincide closely. However, some additional factors are discussed, inclusion of which may improve the correspondence.

The results of the analysis of oviposition preference and survival suggest an explanation of the observed distribution of *Lipara lucens* under natural conditions.

#### XI. REFERENCES

- ALLAN, S. E. and W. H. PEARSALL, 1963: Leaf analysis and shoot production in *Phragmites*. *Oikos* **14**, 176-189.
- AUBERT, J. F. and N. SHAMAR, 1962: Nouvelle expérience sur le déterminisme du sexe chez les Ichneumonidae Pimplinae (Insectes hyménoptères): ponte dans des cocons pleins et des cocons creux. *C.r. hebd. Séanc. Acad. Sci., Paris* **225**, 2194-2195.
- AVIDOV, Z., M. J. BERLINGER and S. W. APPLEBAUM, 1965: Physiological aspects of host specificity in the Bruchidae. III Effect of curvature and surface area on *Callosobruchus chinensis* L., *Anim. Behav.* **13**, 178-180.
- BAKKER, D., 1957: De levenswijze van het riet, in: D. Bakker en D. T. Bieuwlinga: Het riet in de Noordoostpolder. *Van Zee tot Land* **21**, 5-25.
- BAKKER, D., 1960: Het botanisch onderzoek in de IJsselmeerpolders. *Vakbl. Biol.* **40**, 63-79.
- BLAIR, K. G., 1932: Some notes on the galls of *Lipara lucens* Mg. (Diptera, Chloropidae). *Entomologist's mon. Mag.* **68**, 10-13.
- BLAIR, K. G., 1944: Further notes on the galls of *Lipara lucens* Mg. (Diptera, Chloropidae). *Entomologist's mon. Mag.* **80**, 6-7.
- CAIN, A. J. and P. M. SHEPPARD, 1954: Natural selection in *Cepaea*. *Genetics*, Princeton **39**, 89-116.
- CLAUSEN, C. P., 1939: The effect of host size upon the sex ratio of hymenopterous parasites and its relation to methods of rearing and colonization. *Jl. N.Y. ent. Soc.* **47**, 1-9.